SCIENTIFIC ARTICLE

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# Treatment delays in paediatric dento-alveolar trauma at a tertiary referral hospital

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**Abstract**

***Background:*** Paediatric dento-alveolar trauma is a common event. Delays in treatment can have adverse effects on long term outcomes and the aim of this study was to quantify the treatment delays in paediatric dento-alveolar trauma in a tertiary referral hospital.

***Methods:*** All cases of paediatric dento-alveolar trauma over a two year period from July 2000 to June 2002 were identified and the charts were reviewed retrospectively. All children presenting to the emergency department with dento-alveolar trauma within 48 hours of injury during the time period were included.

***Results:*** Forty-three patients were identified. The average age was 5.51 years, though there was a bias towards one and two year olds. Males were injured 1.5 times more frequently than females. There was an average delay of 9.6 hours between injury and treatment for all patients. Transit time from outside practitioners to hospital and waiting times in hospital made up the greatest delays. Children injured an average of 2.37 teeth and only 14 per cent were uncomplicated crown fractures.

***Conclusions:*** Children who present to children's hospitals for treatment of dento-alveolar trauma have more severe injuries than those treated elsewhere. They have large but potentially reducible delays between injury and treatment.

***Key words:*** Paediatric, dento-alveolar, trauma, delay.

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## INTRODUCTION

Dento-alveolar injuries are common in the paediatric population both in Australia[1-3] and other developed[4] and lesser developed countries.[5] These injuries have the potential to cause significant short and long term aesthetic and functional morbidity in affected patients. The prevalence of dento-alveolar injuries varies widely depending on the method of survey, survey population and definition of injury applied and the reported prevalence ranges from 6[3] to 34 per cent.[6] Stockwell's study of injury to the permanent dentition in the Western Australian School Dental Service established an incidence rate of 1.7 per cent per year in 6-12 year olds.[2]

Falls clearly prevail as the leading cause of injury in children[2,7-9] being responsible for over 50 per cent of cases. Other leading causes are impacts with a person or object, bicycle accidents, motor vehicle accidents, sporting activities and intentional injuries, including parental abuse.[1,2,7-12]

Treatment timing guidelines have been reviewed by Andreasen *et al.*[13] and they subdivide dento-alveolar trauma into the following groups: 1) acute treatment requirement (within three hours) – avulsion, extrusion, root fractures and alveolar fractures; 2) subacute treatment requirement (within 24 hours) – crown and crown/root fractures, intrusion, concussion, subluxation and primary tooth injuries which do not interfere with the occlusion or displace into the follicle of the permanent tooth; and 3) delayed treatment requirement (after 24 hours) – crown fractures.

Whilst there is clear evidence of decreased prognosis for some injury subtypes with increased treatment delay, there is a lack of statistically significant data for others.[13] All injuries that cause pain to the patient should be considered urgent and treatment provided to at least alleviate the discomfort.

Hospitals, dental clinics and private dental practices which offer a 24 hour service would expect to see a greater proportion of emergency dental presentations including traumatic injuries. The injuries seen in patients who present after hours to hospital emergency departments seem to be more severe in nature[14] when compared to patients seen in private practice.[15]

Previous investigations into paediatric dental trauma have sought to clarify the incidence, demographic details of patients suffering injuries, aetiology, injury subtypes and treatment.[1-12,14-18] Little information is available on the causes of delays in the treatment of children who present with dento-alveolar trauma. The specific objectives of this study were to profile the time course from injury to treatment and quantify treatment

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delays; describe and compare the age, sex and location of origin of children who present to the hospital's emergency department for treatment; and establish the relative types and severity of injuries in patients who present to a hospital for treatment of dento-alveolar trauma.

## MATERIALS AND METHODS

The study was conducted at the Royal Children's Hospital, which is located in Brisbane, Queensland. It is a 168 bed hospital which provides a tertiary referral service for Queensland north of the Brisbane River to approximately Redcliffe, a distance of approximately 35 kilometers. It also accepts referrals for specialized conditions from the remainder of Queensland, Northern New South Wales and internationally. The emergency department is staffed on a 24 hour basis by emergency physicians, emergency medicine registrars and resident medical staff. Twenty-four hour cover for dental, oral and facial injuries are provided by paediatric dentists from the Children's Oral Health Service dental unit and maxillofacial surgical registrars, and consultants from the Maxillofacial Surgical Unit who provide a remote call service after hours and are required to be available within 30 minutes. Patients presenting to the emergency department are initially triaged by an experienced registered nurse who assigns an urgency category. They are then assessed by medical staff who determine whether dental expertise is required.

The study was conducted retrospectively over a two year period from July 2000 to June 2002.

The selection criteria used for inclusion in the study were: 1) age 0-14 years; 2) admission via the Emergency Department; and 3) injuries to the teeth or supporting structures.

Patients with isolated lip lacerations and other soft tissue injuries not involving the alveolus were excluded unless a concomitant dental injury was present. Patients who presented as outpatient referrals to the Children's Oral Health service for treatment and those presenting to hospital more than 48 hours after their injury were also not included. The aim of excluding the above patients was to limit the population to those who present as emergencies to a hospital and require dental expertise in treatment.

Identification of the study population was undertaken by use of the ICD10 admission codes.[19] All records were reviewed primarily by the principal author, and a random selection of 10 per cent of the records were assessed for examiner reliability.

Information was collected on patient demographics, injuries suffered, time of injury, presentation time and treatment time at the referring practitioner if applicable, presentation time to the emergency department, time of review by emergency department medical staff, time of review by either paediatric dentist or maxillofacial surgical registrar and time of definitive treatment if provided. If the injury was thought not to require treatment by the paediatric dentist or maxillofacial registrar then the time of their review was recorded as the treatment time.

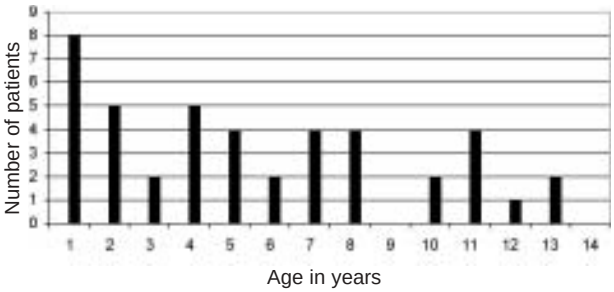


**Fig 1.** Number of patients by age.

In an attempt to differentiate differences in magnitude and causes of treatment delays, patients were subdivided into those who presented directly to the emergency department, those who were referred from a metropolitan local dental officer or practice (LDO) or those referred from outside the Brisbane metropolitan area.

Patients were also subdivided into acute, subacute and delayed treatment requirement for further analysis of treatment delay, according to Andreasen's recommendations[13] as described in the introduction.

Statistical analysis consisted of Student's *t* tests with two tailed distributions performed in Microsoft Excel.

Ethics committee approval was obtained through the Royal Children's Hospital Ethics Committee and the University of Queensland Ethics Committee.

## RESULTS

During the 24 month period from June 2000 to July 2002, 43 patients were identified who met the inclusion criteria described above. Two patients presented at 77 hours and 94 hours post injury and were excluded from the analysis. The average age of the patients was 5.51 years though a bias towards younger patients was present with 1 and 2 year olds making up 30 per cent of patients (Fig 1).

Males comprised 60 per cent of patients (n=26) and females comprised 40 per cent (n=17) which gives a ratio of 1.5:1. There was no difference between the average age of males and females.

Patients were referred from outlying zones ranging from Bundaberg (380 kilometers north) to Ballina (220 kilometers south), though the majority, 84 per cent were from the Brisbane metropolitan area. Of the patients from zones outside Brisbane, 86 per cent were referred in by other practitioners for management compared with 32 per cent of those from the Brisbane metropolitan area. In other words, those from outside Brisbane were 2.75 times more likely to seek attention elsewhere prior to being treated in hospital.

Forty nine per cent of presentations for dento-alveolar trauma occur during working hours (n=21) and 51 per cent after hours (n=22). Only 4 per cent

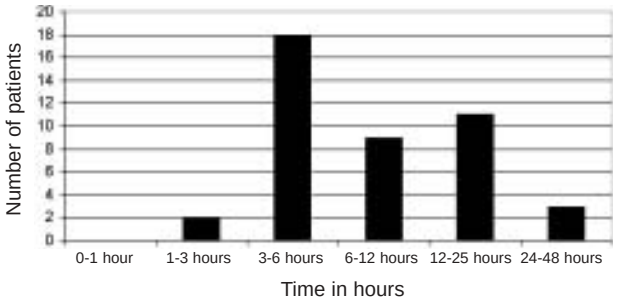


**Fig 2.** Injury time to treatment time.

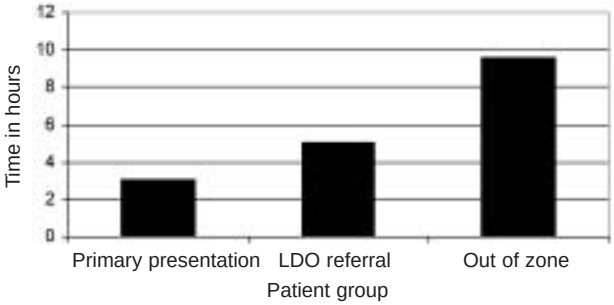


**Fig 4.** Average transit times. LDO stands for local dental officer or referring institution.

(n=2) of after hours patients presented between midnight and 9am.

The period between time of injury and time of treatment ranged from 1.8 hours to 28.7 hours with an average of 9.6 hours. Only 5 per cent (n=2) patients were treated less than three hours after suffering their injury, 7 per cent (n=3) waited more than 24 hours from injury to treatment. The distribution of injury time to treatment time is shown in Fig 2 for all patients.

The average delay between injury and treatment was 7.98 hours for patients who attended as primary presentations to the emergency department which was markedly less than the average of 11.95 hours for children who presented to their local practitioner initially (p=0.08).

Figure 3 shows the differences between time spent in transit, and time waiting for treatment after arrival at the LDO or the hospital.

The average transit time for patients who presented directly to the emergency department, those referred from a metropolitan LDO and those from outside the Brisbane Metropolitan area are shown in Fig 4.

Patients from outside the metropolitan zone had an average transit time of 9.5 hours versus 3.8 hours for patients from within the Brisbane metropolitan zone (p=0.006). Patients who presented to their LDO prior to presentation to hospital had an average transit time of 6.9 hours compared to 2.7 hours for those who presented initially to hospital (p=0.015).

On average children injured 2.37 teeth per accident (range 1-5). Incisor teeth were more commonly affected. There was one case of an injury to a premolar (2.2 per cent), and five cases suffered injuries to the canines (11 per cent).

The maxillary dentition was affected in 81 per cent of cases (n=35), the mandible in 7 per cent (n=3) and both jaws in 16 per cent (n=7). Displacement injuries of the periodontium were the most commonly occurring injuries. Uncomplicated crown fractures were relatively uncommon (14 per cent). The subtypes and number of injuries is shown in Fig 5. A number of children suffered more than one type of injury.

The urgency of treatment requirement showed no statistically significant correlation with the treatment delay. Patients in the acute group (n=23, 53 per cent) had an average delay of 10.96 hours between injury and treatment, those in the subacute group (n=15, 35 per cent) had an average delay of 7.31 hours and those in the delayed group (n=5, 12 per cent) had an average delay of 9.6 hours. The majority of patients, 77 per cent (n=33), underwent general anaesthesia though on some occasions this was due to their concomitant injuries.

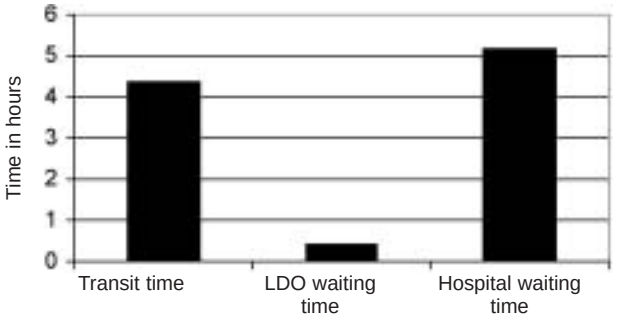


**Fig 3.** Treatment delays. LDO stands for local dental officer or referring institution.

## DISCUSSION

The total number of patients presenting to the Royal Children's Hospital Emergency Department with dento-alveolar trauma in the study period who met the inclusion criteria described was only 43 cases. The majority of traumatic injuries to the dentition are treated in other institutions as evidenced by another

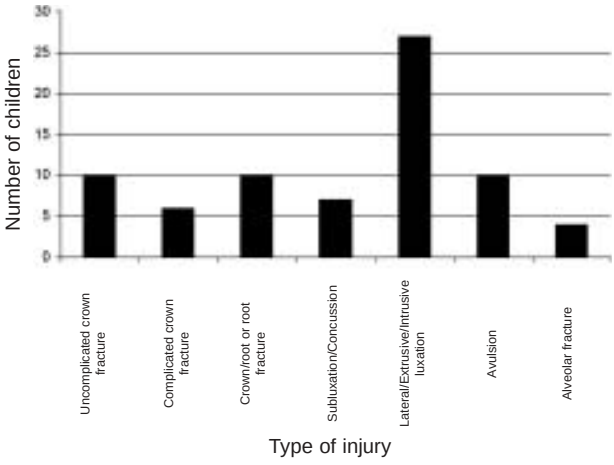


**Fig 5.** Dento-alveolar injuries.

study in the same geographic location which revealed 130 patients in the same age range as this study in one calendar year.[1] The exclusion of lip lacerations and soft tissue injuries without trauma to the dentition is partly responsible for the relatively low numbers and the disparity between this study and others of a similar population.[7,16]

One and 2 year olds comprised 30 per cent of our study population which is consistent with other hospital based series,[7,11,12] and this can be compared with Wood and Freer's study of dental clinics that demonstrated a peak age group of 6-10.[1] There did not appear to be a significant difference in the age groups between those seen primarily through the emergency department and those referred in from other institutions.

A large proportion of paediatric patients, 77 per cent in this study, with traumatic dental injuries will require general anaesthetic for treatment either due to the severity of the injury or difficulty in obtaining co-operation following trauma. General anaesthesia is usually only available in hospital facilities. Consideration needs to be given to allow access to hospital facilities in peripheral hospitals without resident dentally trained staff, for external dental practitioners to treat dento-alveolar trauma in children. This would alleviate the need for transfer of patients injured in non-metropolitan areas and decrease the delay before treatment. However, some patients will always require transfer due to the need for specialist management of their injuries.

The delay between injury and treatment was a focus of this study, as there appears to be a paucity of information in the literature regarding the causes of delayed management.

The time from injury to treatment in the patients in this study was not encouraging. Those patients who were referred by other practitioners or institutions had a greater delay prior to definitive treatment. This is probably due to increased transit and waiting times. Indeed one of the greatest delays occurs in transit from the referring practitioner or institution to the hospital especially the patients transferred by practitioners from out of the catchment area of the Children's Hospital. Other factors may extend this transit time such a parents returning home to obtain clothing, deal with other children or make distance travel arrangements etc. prior to presenting to hospital. The urgency of timely presentation at the hospital needs to be reinforced by the referring practitioner in these cases. Time is spent waiting for specialist review in the hospital which is a reflection of the remote call nature of the service. Waiting time for treatment after review by the dental specialist is also relatively long, averaging approximately three hours. Access to general anaesthetic facilities after hours and on weekends has inherent delays. Waiting for an available theatre, calling anaesthetists from remote call and arranging equipment all contribute to the delay. As can be seen in Fig 3, time spent waiting in the hospital after initial presentation and before treatment is the single greatest delay from injury to treatment. The transit time from injury to local practitioner, wait at the local practitioner, and waiting in the emergency department of the hospital all were under one hour in duration.

The effect of delayed treatment on outcomes is not as critical for patients with less severe injuries. However, this study demonstrates even patients with an acute treatment requirement had an average delay of 10.96 hours which did not differ markedly from those with a subacute or delayed treatment requirement. This suggests that the cause of delay in therapy is due to the logistic issues discussed above rather than clinician decisions regarding timing of treatment. Although not linked to outcome in this study, a delay of 10.96 hours in patients with an acute treatment requirement is well beyond the three hour recommendation made by Andreasen *et al*.[13]

The injuries suffered by the patients in our study were in general of a more severe nature than those presenting to dental clinics,[1] and hospital paediatric outpatient clinics.[9] Uncomplicated crown fractures, which could be considered the most benign dento-alveolar injury, occurred in only 14 per cent of the patients in this study. They made up 48.4 per cent of outpatient clinic patients in one study,[9] and 40 per cent of patients in Wood and Freer's study of dental clinics.[1] Displacement injuries of the periodontium were the most common injuries in this study. More teeth were also injured per child in our study (2.37) compared with studies on a comparable population (1.23) attending a School Dental Service.[2] The presentation to hospitals of more serious injuries is not surprising and has been noticed by other authors.

Data from this study have the limitation of being unable to determine the incidence of dento-alveolar trauma in the population studied. In addition retrospective reviews suffer inherent problems with data recording accuracy and interpretation.

## CONCLUSIONS

This study has confirmed that children presenting to hospitals with traumatic dental injuries are of a younger age group and have a greater severity of injury compared with children seen in general dental clinics. They have large and potentially reducible delays between injury and treatment which are both prior to and subsequent to arriving at hospital.

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